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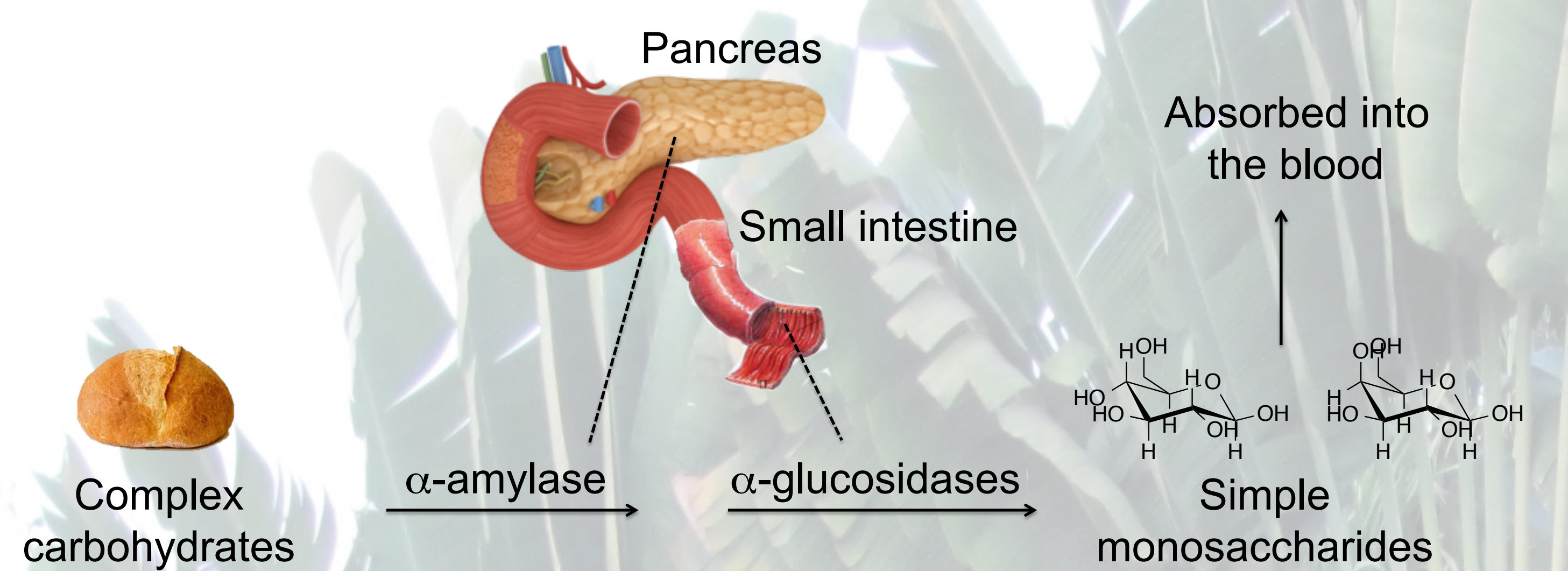
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Inhibitory potential of 40 medicinal plant extracts from Madagascar against enzymes linked to type 2 diabetes

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Background:

Worldwide, 382 million people have diabetes and the estimated figure for 2035 is 592 million.¹ Management of blood glucose by inhibition of carbohydrate-hydrolyzing enzymes is important to avoid diabetic complications. The post-meal increase in blood glucose levels, which causes hyperglycaemia in type 2 diabetics, occurs due to hydrolysis of starch by pancreatic α -amylase and intestinal α -glucosidases.² α -Amylase and α -glucosidase inhibitors are potential targets in the development of lead compounds for the treatment of diabetes.³



Aim:

The aim of this study was to assess whether inhibition of α -glucosidase and/or α -amylase by ethanol extracts of 40 Madagascarian plants is the scientific rationale behind their traditional anti-diabetic use.

Results:

The ethanolic extracts of the plants shown in Table 1 were tested at different concentration in α -glucosidase⁴ and α -amylase⁵ inhibition assays.

The extracts were inactive against pancreatic α -amylase, with two exceptions:

- *Psidium guajava* bark extract: IC₅₀ = 10.6 μ g/mL
- *Vangueria madagascariensis* bark extract: IC₅₀ = 11.6 μ g/mL

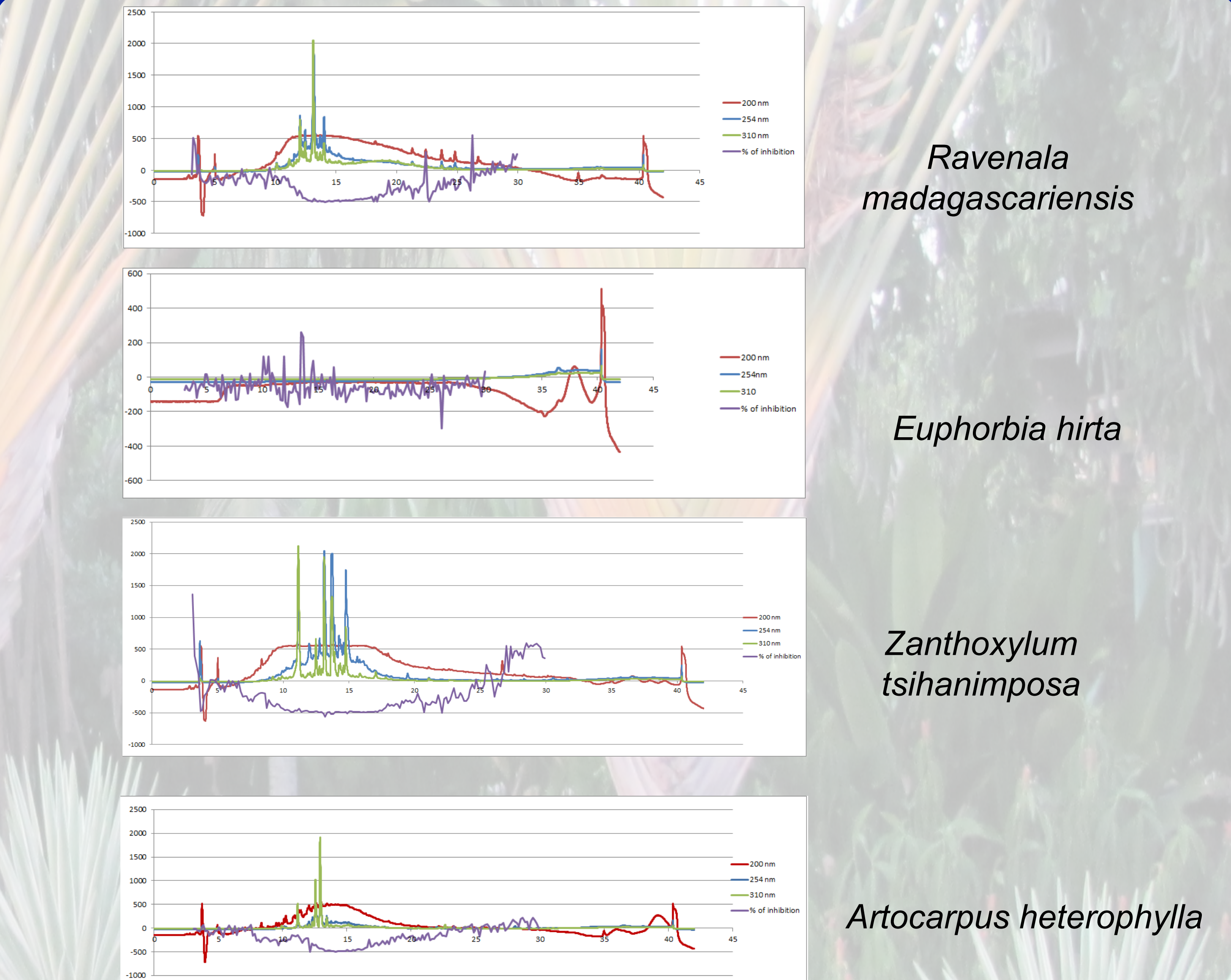
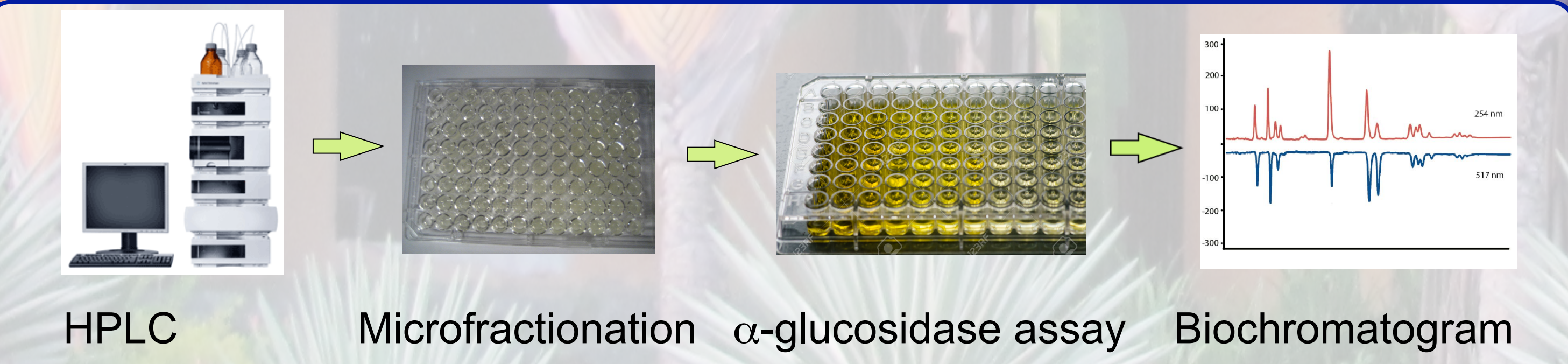
Several extracts showed strong inhibition of yeast α -glucosidase:

- Bark extract of *Psidium guajava*: IC₅₀ = 0.5 μ g/mL
- Leaf extract of *Psidium guajava*: IC₅₀ = 1.0 μ g/mL
- Bark extract of *Antidesma madagascariensis*: IC₅₀ = 1.7 μ g/mL
- Bark extract of *Vangueria madagascariensis*: IC₅₀ = 1.8 μ g/mL
- Leaf extract of *Rhizophora* sp: IC₅₀ = 1.8 μ g/mL

All extracts with IC₅₀ below 15 μ g/mL were investigated for their content of tannins, known to give false-positive results in enzyme-based in vitro assays due to their non-specific enzyme binding. All active extracts had large amounts of tannins in the HPLC chromatogram, except aerial parts of *Euphorbia hirta* and leaves of *Artocarpus heterophylla*, *Ravenala madagascariensis*, and *Zanthoxylum tsihanimposa*, which contained only low levels of tannins. These four species were subjected to high-resolution α -glucosidase bioactivity profiling⁵, in order to determine whether they contained specific enzyme inhibitors. It was, however, found that the α -glucosidase inhibitory profile correlated fully with the elution profile of the tannins.

Table 1: Plants included in this work

Scientific name	Part	Scientific name	Part
<i>Zanthoxylum tsihanimposa</i>	Leaves, Bark	<i>Antidesma madagascariensis</i>	Leaves, Bark
<i>Flacourtia indica</i>	Leaves, Bark	<i>Vangueria madagascariensis</i>	Leaves, Bark
<i>Rhizophora</i> sp	Leaves	<i>Rhizophora mucronata</i>	Bark
<i>Mystroxydon aethiopicum</i>	Leaves	<i>Pothos scandens</i>	Aerial parts
<i>Ambrosia maritime</i>	Aerial parts	<i>Eriobothrya japonica</i>	Leaves, Bark
<i>Ravenala madagascariensis</i>	Leaves	<i>Psidium guajava</i>	Leaves, Bark
<i>Artocarpus heterophylla</i>	Leaves, Bark	<i>Stachytarpheta jamaicensis</i>	Aerial parts
<i>Dracaena reflexa</i>	Bark	<i>Kotschy pierreri</i>	Aerial parts
<i>Leptadenia madagascariensis</i>	Aerial parts	<i>Euphorbia hirta</i>	Aerial parts
<i>Cedrelopsis grevei</i>	Leaves, Bark	<i>Eugenia jambolana</i>	Dried fruit
<i>Avicennia marina</i>	Leaves, Bark	<i>Momordica charantia</i>	Fruit
<i>Gyrostipula foveolata</i>	Leaves, Bark	<i>Equisetum ramosissimum</i>	Aerial parts
<i>Bidens pilosa</i>	Aerial parts	<i>Jatropha curcas</i>	Leaves, Bark
<i>Portulaca oleracea</i>	Aerial parts	<i>Catharanthus roseus</i>	Aerial parts, Root



Conclusion:

Natural α -amylase and α -glucosidase inhibitors from plants can be used as an effective therapy for treating post prandial hyperglycemia with minimal side effects. In this study, the 40 plant species traditionally used in Madagascar to treat diabetes do not hold promise as specific inhibitors of the carbohydrate-hydrolyzing enzymes α -amylase and α -glucosidase.

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